From:	Guzman, Richard
To:	Shayan.Sinha@dominionenergy.com
Cc:	Danna, James
Subject:	Millstone Power Station, Unit 3 - Request for Additional Information Regarding License Amendment Request for Measurement Uncertainty Recapture Power Uprate (EPID L-2020-LLS-0002)
Date:	Thursday, April 22, 2021 2:29:08 PM

Mr. Sinha,

On April 8, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff sent Dominion Energy Nuclear Connecticut, Inc. (DENC, the licensee) the subject Request for Additional Information (RAI) as a draft e-mail. The RAI relates to the licensee's license amendment request dated November 19, 2020 (ADAMS Accession No. ML20324A702), proposing a license amendment to increase the Millstone Unit 3 rated thermal power level from 3,650 megawatts thermal (MWt) to 3,709 MWt, an increase in RTP of approximately 1.6%.

On April 20, 2021, the NRC staff and DENC held a conference call to discuss clarifications on the draft RAI. Updated below is the official (final) RAI. As we discussed, please respond to this RAI within 45 days of this e-mail communication, or no later than June 7, 2021. A publicly available version of this message will be placed in the NRC's official recordkeeping system (ADAMS). Please contact me if you have any questions in regard to this request.

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REQUEST FOR ADDITIONAL INFORMATION (RAI)
REGARDING LICENSE AMENDMENT REQUEST FOR
MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE
MILLSTONE POWER STATION, UNIT NO. 3
DOCKET NO. 50-423
EPID: L-2020-LLS-0002

By letter dated November 19, 2020 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML20324A702), Dominion Energy Nuclear Connecticut, Inc. (DENC, the licensee) submitted a license amendment request (LAR) for the Millstone Power Station, Unit No. 3 (MPS3). The proposed license amendment would increase MPS3 rated thermal power (RTP) level from 3,650 megawatts thermal (MWt) to 3,709 MWt, an increase in RTP of approximately 1.6%. The proposed increase is referred to as a measurement uncertainty recapture (MUR) power uprate and is based on utilizing an installed Cameron Technology US LLC (currently known as Sensia, formerly known as Caldon) Leading Edge Flow Meter CheckPlus system as an ultrasonic flow meter located in each of the four main feedwater lines supplying the steam generators to improve plant calorimetric heat balance measurement accuracy. The proposed changes would also involve an editorial correction to technical specification (TS) 2.1.1.1 and revision to TS 3.7.1.1, Action Statement "a" and TS Table 3.7-1, "Operable MSSVs Versus Maximum Allowable Power" to update the maximum allowable power levels corresponding to the number of operable main steam safety valves per steam generator.

The NRC staff has determined that additional information is needed to complete its review, as described in the request for additional information (RAI) shown below.

Regulatory Basis: Vessels and Internals (NVIB) RAIs

The regulation at 10 CFR 50.55a requires that the reactor pressure vessel (RPV) be constructed, designed and analyzed in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section III.

The regulation at 10 CFR 50.61 requires pressurized thermal shock (PTS) evaluations to ensure that adequate fracture toughness exists for RPV beltline materials in pressurized water reactors (PWRs) to protect against failure during a PTS event. Fracture resistance of RPV beltline materials during PTS events is evaluated by calculating the nil-ductility temperature (RTNDT) for PTS (identified as RTPTS). Section 50.61(b)(1) requires that PWR licensees have projected values of RTPTS accepted by the NRC for each RPV beltline material. Section 50.61(c)(2) requires that RTPTS calculations for RPV beltline materials incorporate credible RPV surveillance material test data that are reported as part of the RPV materials surveillance program required by 10 CFR Part 50, Appendix H.

NVIB-RAI-1

Section IV.1.A.ii.e, "Mechanical Evaluation," in Attachment 4 of the LAR states that the MUR power uprate design conditions do not affect the current design bases for seismic and loss-of-coolant accident (LOCA) loads. The licensee further stated that the stress levels caused by the flow induced vibration on the core barrel assembly and upper internals are low and remain well below the material high-cycle fatigue endurance limit. Summarize the mechanical evaluation that demonstrates the core barrel assembly and upper internals are not affected by the MUR power uprate design conditions, including a discussion on the acceptance criteria, resulting stresses and fatigue endurance limits.

NVIB-RAI-2

Section IV.1.A.ii.f, "Structural Evaluation," in Attachment 4 of the LAR states that evaluations were performed to demonstrate that the structural integrity of reactor internal components is not adversely affected by the MUR power uprate design conditions. The NRC staff requests the licensee to (a) summarize the structural evaluation that demonstrates the reactor internal components are not adversely affected by the MUR power uprate design conditions, including a discussion on the acceptance criteria and resulting stresses and (b) discuss whether there are any cracks in any of the RPV internal components. If there are any cracks, discuss whether an evaluation has been performed and how this evaluation demonstrates sufficient structural integrity of the degraded reactor internal component under the MUR power uprate conditions.

NVIB-RAI-3

Section IV.1.A.ii.g, "Upper and Lower Core Plate Structural Analysis," in Attachment 4 of the LAR states that thermal design transients, heat generation rates, and operating conditions affect thermal loads on the upper and lower core plates. The licensee stated that for the MUR power uprate, current analysis of record (AOR) thermal design transients and heat generation rates remain applicable because the MUR power uprate operating conditions are bounded by the operating conditions in the current AOR. The licensee further stated that the maximum primary plus secondary stress intensity of the upper and lower core plate and cumulative usage factor remain acceptable. Summarize how the existing structural analysis for the upper and lower core plates is still applicable under the MUR power uprate conditions, including a discussion on the acceptance criteria and resulting stresses.

NVIB-RAI-4

Section IV.1.A.ii.h, "Baffle-Barrel Region Evaluations," in Attachment 4 of the LAR states that the baffle bolts are subjected to primary loads consisting of deadweight, hydraulic pressure differentials, LOCA and seismic loads, and secondary loads consisting of preload and thermal loads resulting from reactor coolant system (RCS) temperatures and gamma heating rates. The licensee stated that it evaluated the baffle former bolt maximum displacement at the MUR power uprate design conditions. The licensee concluded that the existing thermal and structural analysis of the baffle-barrel region results remain bounding for the MUR power uprate design conditions. The NRC staff requests the licensee to summarize (a) how the existing thermal and structural analysis of the baffle barrel region remain bounding under the MUR power uprate design conditions, including a discussion on the baffle former bolt maximum displacement and stresses under the MUR power uprate design conditions and (b) the inspection history and results of former baffle bolts and plates.

NVIB-RAI-5

Section IV.1.A.iii.a, "Bottom Mounted Instrumentation (BMI)," in Attachment 4 of the LAR discusses the stress analysis of the BMI guide tubes. The licensee stated that the range of vessel core inlet temperatures for the MUR power uprate is 536.7 degrees Fahrenheit (°F) to 555.8°F, which is lower than the RPV core inlet temperature in the existing analysis. These temperatures are bounded by the BMI guide tube design temperature of 560°F. Clarify whether the existing stress analysis of the BMI guide tubes is based on the design temperature of 560°F.

NVIB-RAI-6

Section IV.1.C.i, "Pressurized Thermal Shock (PTS) Calculations," in Attachment 4 of the LAR states that the limiting reference temperature for PTS (RT_{PTS}) value of 130°F applies to Lower Shell Plate B9820-2. The licensee stated that this is a change from the AOR that had a limiting RT_{PTS} value of 133°F pertaining to Intermediate Shell Plate B9805-1. The NRC staff requests the licensee to (a) clarify the cause of the changes in the RT_{PTS} value from 133°F to 130°F and the limiting beltline material, and (b) discuss whether the RT_{PTS} value of 130°F was derived based on the MUR power uprate conditions.

Regulatory Basis: Nuclear Systems Performance (SNSB) RAIs

Appendix A to 10 CFR 50 establishes minimum criteria (General Design Criteria or GDC) for the safe operation of light water reactors. GDC 10, "Reactor Design", requires that the reactor core and associated coolant, control, and protection systems be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. Fuel design limits are challenged by transients described in the MPS3 Updated Final Safety Analysis Report (UFSAR) sections 15.1.3, 15.3.1, 15.3.2, 15.4.3, and 15.6.1.

GDC 15, “Reactor coolant system design”, requires that reactor coolant system and associated auxiliary, control, and protection systems be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences. UFSAR sections 15.2.6, 15.2.7, and 15.3.2 describes analyses of anticipated operational occurrences which could challenge the reactor coolant pressure boundary.

GDC 28, “Reactivity limits”, requires reactivity control systems to be designed with appropriate limits on potential reactivity increases so the effects of a postulated rod ejection accident can result in neither damage to the reactor coolant pressure boundary nor result in sufficient disturbance to impair the core cooling capability. The transient described in UFSAR section 15.4.8 helps to demonstrate that this criterion is met.

GDC 31, “Fracture prevention of reactor coolant pressure boundary”, requires that the reactor pressure boundary be designed with sufficient margin to ensure that the probability of rapidly propagating failure is minimized under postulated accident conditions. UFSAR sections and 15.2.8 and 15.3.3 describes analyses of postulated accidents which could challenge the reactor coolant pressure boundary.

Regulatory Information Summary (RIS) 2002-03 (ADAMS Accession No. ML013530183) provides guidance to addressees on the scope and detail of information that should be provided to NRC for reviewing MUR power uprate applications. The guidance states that in areas for which existing AOR bound plant operation at the proposed power level, the staff will not conduct a detailed review.

Natural circulation cooldown is a portion of the transients described in UFSAR sections 15.2.6, 15.2.7, 15.2.8, and 15.3.2. The current licensing analysis for this event documents compliance with the guidance in Branch Technical Position (BTP) 5-1.

SNSB-RAI-7

The licensee described the power level assumed when analyzing accidents and transients for MPS3 in Table II-1 of Attachment 4 to the LAR. However, the NRC staff notes that the information in the LAR, Table II-1 is not consistent with the information in Table 15.0-2 of the UFSAR, Revision 33. Specifically, there is a discrepancy for the thermal power level listed for accidents in UFSAR sections 15.1.3, 15.3.1, 15.3.2, 15.4.3, 15.4.8, 15.6.1, and the DNB analysis in UFSAR section 15.3.3. To ensure that various analyses can be accepted without detailed review, please explain the discrepancy between the power listed in Table 15.0-2 of the UFSAR and Table II-1 of Attachment 4 to the LAR for accidents described in UFSAR sections 15.1.3, 15.3.1, 15.3.2, 15.4.3, 15.4.8, 15.6.1, and the DNB analysis in UFSAR section 15.3.3. For any of these cases, if the discrepancy exists because a portion of the analysis was performed assuming a power level that does not bound the uprated power level, please provide a justification or summarize the updated analysis.

SNSB-RAI-8

The licensee provided an evaluation for the natural circulation cooling event in support of the MUR power uprate in Section III.3-1 of Attachment 4 to the LAR. In their evaluation, the licensee indicated that the current AOR was performed at 3650 MWt, which does not bound the power level proposed in the MUR power uprate. The licensee has repeated the natural circulation cooling analysis at conditions bounding the MUR power uprate, and confirmed that RCS cooldown and adequate boron mixing can be achieved. However, the licensee did not describe RCS pressure control or depressurization in their evaluation. The initial licensing evaluation, as well as an evaluation performed in support of a stretch power uprate, confirmed that pressure control can be achieved during a natural circulation cooling event. Please confirm that RCS pressure control can be maintained and depressurization can be achieved in a natural circulation cooling event at conditions bounding the MUR uprate.

Regulatory Basis: Electrical Engineering (EEEB) RAIs

GDC 17, “Electric power systems,” of Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR 50, states in part, “An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.”

RIS 2002-03, "Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications," Section V, “Electrical Equipment Design,” states in part, “A discussion of the effect of the power uprate on electrical equipment... For equipment that is not bounded by existing analyses of record, a detailed discussion should be included to identify and evaluate the changes related to the power uprate. Specifically, this discussion should address the following items: …D. grid stability.”

Office of Nuclear Reactor Regulation office instruction LIC-105, “Managing Regulatory Commitments Made by Licensees to the NRC”, Revision 7 (ADAMS Accession No. ML16190A013), Section 4.1, “Creation of Regulatory Commitments,” states in part, “Regulatory commitments…do not warrant either legally binding requirements or inclusion in updated final safety analysis reports (UFSARs) or programs subject to a formal regulatory change control mechanism.”

EEEB-RAI-9

The NRC staff evaluated the LAR for consistency with RIS 2002-03, GDC 17, and the MPS3 UFSAR. Specifically, as referenced in Attachment 4 of the LAR, Section V, “NRC Regulatory Issue Summary 2002-03 Topic: Electrical Equipment Design,” RIS 2002-03 specifies that a discussion of the effect of the power uprate on electrical equipment be included in the LAR, specifically in four areas, one of which is grid stability. A typical grid stability study for a nuclear power plant assesses (1) the impacts of the loss, through a single event, of the largest capacity being supplied to the grid, (2) the removal of the largest load from the grid, (3) the most critical transmission line if unavailable that results in the loss of offsite power, (4) any increased main generator output adverse effects, and (5) confirms adequate reactive power support at the lowest post-contingency 345kV switchyard voltage. The NRC staff has determined that the LAR for MUR implementation does not provide sufficient information about grid stability and the 345 kV switchyard to complete its review.

Section 3.0, “Technical Analysis,” in Attachment 1 of the LAR states, “In support of meeting the ISO-New England requirements, main generator upgrades will be required to transmit additional megawatts electric (MWe) to the grid at uprate conditions.”

Section V.1.F.i, “Main Generator,” in Attachment 4 of the LAR states, “The main generator requires upgrades in order to accommodate the MUR Power Uprate at the required ISO-New England power factor.”

Please provide the MPS3 combined main generator (MG) output (in megawatts (MW) and/or mega voltamperes (MVA) segregating the contributions due exclusively to the MG upgrade and MUR implementation (the NRC only regulates the MUR portion).

EEEB-RAI-10

Section V.1.D, “Grid Stability,” in Attachment 4 of the LAR states that an Interconnection System Impact Study will be performed in accordance with the processes of ISO-NE Schedule 22, Large Generator Interconnection Procedures and will evaluate the impact of the proposed interconnection on the reliability and operation of the New England Transmission System. The licensee also identified the study would consist of a short circuit analysis, a stability analysis, a power flow analysis (including thermal analysis and voltage analysis), a system protection analysis and any other analyses that are deemed necessary by the System Operator (ISO-NE) in consultation with the Interconnecting Transmission Owner (Eversource).

Section V.1.G, “Switchyard Interface,” in Attachment 4 of the LAR states:

The 345 kV switchyard is discussed in FSAR Section 8.1.3. An Interconnection System Impact Study (refer to Section V.1.D) will be performed in accordance with the processes of Reference V.1 (see Regulatory Commitment in Attachment 5). The Interconnection System Impact Study will contain any other analyses that are deemed necessary by the System Operator (ISO-NE) in consultation with the Interconnecting Transmission Owner (Eversource), which includes evaluation of the 345 kV switchyard and distribution system. This analysis of the switchyard will be prepared by Eversource and will ensures the functionality of the switchyard and its associated components that would be affected by the MUR power uprate.

In Attachment 5 of the LAR, the following regulatory commitment was submitted by the licensee:

(Commitment) DENC will complete an Interconnection System Impact Study, including a grid stability analysis, as described in Attachment 4, Section V.I.D of the MPS3 MUR Power Uprate LAR submittal. (Scheduled Completion Date) The Interconnection System Impact Stability Study will be completed prior to implementation of the MUR Power Uprate for MPS3.”

Please provide additional details about what explicit actions DENC will take including notifying the NRC if the grid stability study results do not meet DENC's or the preparer's designated standard considering effects on (1) MPS3 grid resiliency, (2) 345 kV switchyard functionality, and (3) GDC 17 requirements for onsite and offsite power systems.

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From: Guzman, Richard <Richard.Guzman@nrc.gov>
Sent: Thursday, April 8, 2021 8:02 PM
To: Shayan Sinha (Services - 6) <Shayan.Sinha@dominionenergy.com>; Michael L Whitlock (Services - 6) <michael.l.whitlock@dominionenergy.com>
Subject: [EXTERNAL] Millstone Power Station, Unit 3 - DRAFT Request for Additional Information Regarding License Amendment Request for Measurement Uncertainty Recapture Power Uprate (EPID L-2020-LLS-0002)

Shayan and Michael,

By letter dated November 19, 2020 (ADAMS Accession No. ML20324A702), Dominion Energy Nuclear Connecticut, Inc., submitted the subject license amendment request for Millstone Power Station, Unit No. 3 (MPS3). The NRC staff has determined that additional information is needed to complete its review, as described in the request for additional information (RAI) shown below. This RAI is identified as DRAFT at this time to confirm your understanding of the information needed by the NRC staff to complete its evaluation. If you'd like to have a clarification call, please let me know and I will coordinate availabilities w/the NRC technical staff. I intend to send out the questions below as official no later than April 22nd, if possible.